Spitzer Space Telescope
JURAP Status Report

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Bo Kahr
Deputy Mission Manager

Project Overview

Spitzer Space Telescope

Salient Features

- *Heliocentric orbit trailing the Earth*
- *85 cm Beryllium telescope operating at 5.5 K*
- *3 instruments with 3-180 micron wavelength coverage operating at 1.5 K*
- *Launch date: August 25, 2003*
- *Operational life: 5yr 5mo (2.5 year requirement)*
- *Observing time avail. to general community: > 80%*

Science

- *To search for brown dwarfs and super-planets, and to understand the contribution of sub-stellar objects to the mass of the Galaxy.*
- *To study protoplanetary and planetary debris disks, and to assess the frequency of planetary-system formation around nearby solar-type stars.*
- *To determine properties of ultra-luminous galaxies and active galactic nuclei, both nearby and in the distant Universe, and to understand the mechanisms which power these extremely energetic objects.*
- *To study normal galaxies as they were when the Universe was less than one-quarter of its current size and age, and to understand how galaxies have evolved with cosmic time.*

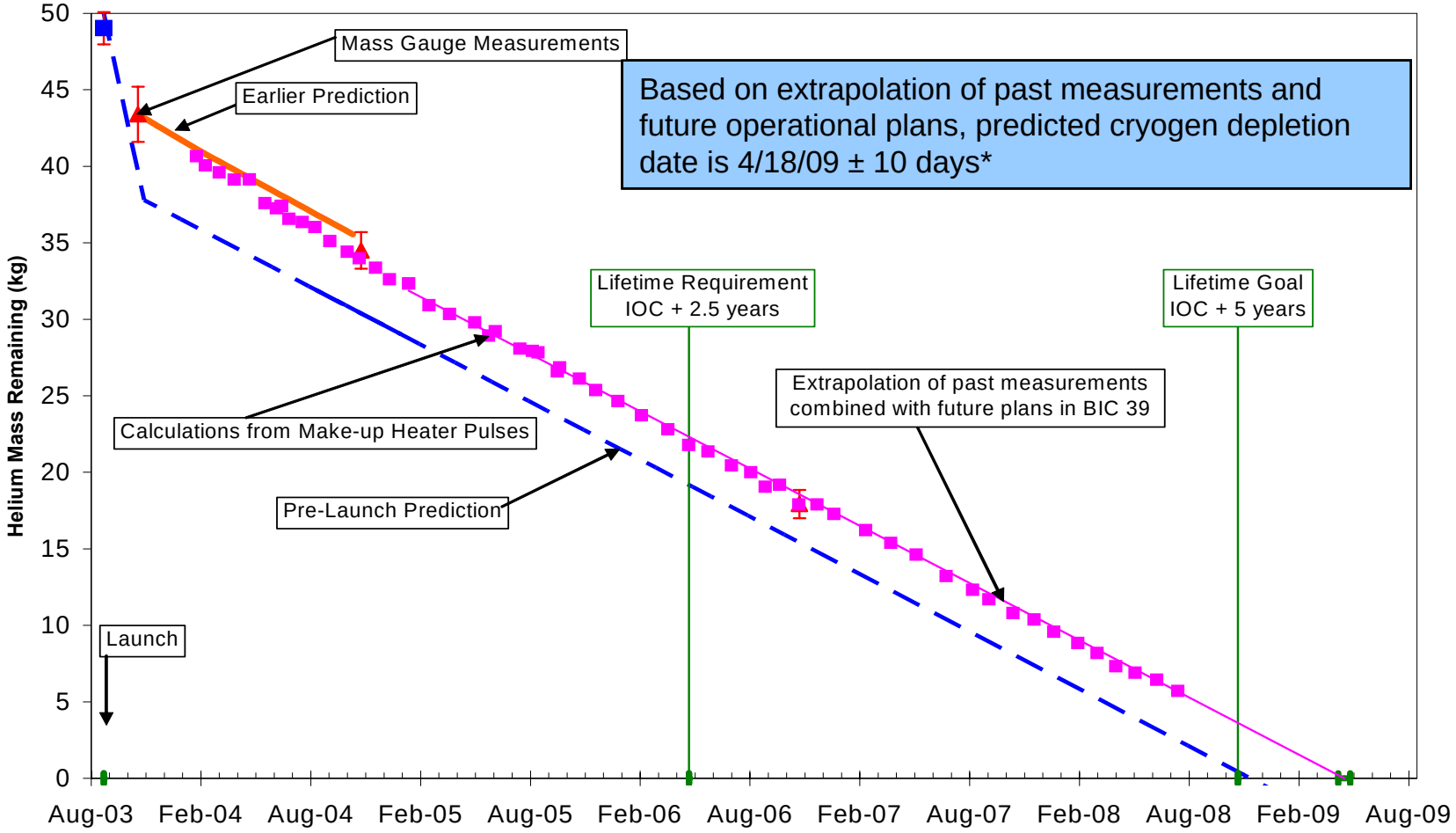
Mission Operations Summary

- Currently in Nominal Operations
- SIRTF Observatory Continues to function normally
  - Successfully executed 247 weeks (1732 days) of observation time.
  - Executing General Observer Cycle 5 (Final Cryogen Cycle)
  - Observatory Efficiency is 91.07% since launch and 92.57% for the last 6 months, (the goal was 90%)
- S/C and Instruments are performing above specifications

3.A.1-1) OBSERVATORY CONSUMABLES

Description	Pre-Launch Prediction for Jul 31	Actual Flight Data as of Jul 31	New Estimate at 2.7 years	New Estimate at 5.2 years	Mission Limit
He Remaining (kg) *Launch=49.1 kg*	2.2	5.0 ± 1	22.2	3	N/A
N2 Remaining (kg) *Launch=15.59 kg*	12.17	12.68	13.9	12.5	N/A
LPIV-1 Cycles	414	313	~ 234	~ 334	988
HPIV-1 Cycles	1	8	6	8	241
Thruster-1 Cycles		637	< 1282	< 1783	4000
Thruster-2 Cycles		828	< 1282	< 1783	4000
Thruster-3 Cycles		349	< 1282	< 1783	4000
Thruster-4 Cycles		229	< 1282	< 1783	4000
Thruster-5 Cycles		1710	< 1282	< 1783	4000
Thruster-6 Cycles		939	< 1282	< 1783	4000

HELIUM USAGE



Depletion date uses a linear extrapolation of mass measurements since January 2005, then adjusts the end date by comparing future operational plans to the past operations.
*Depletion date uncertainty ±14 days based on 2-sigma linearity of data. Historically, this method has errors as large as ±5% (3 months).

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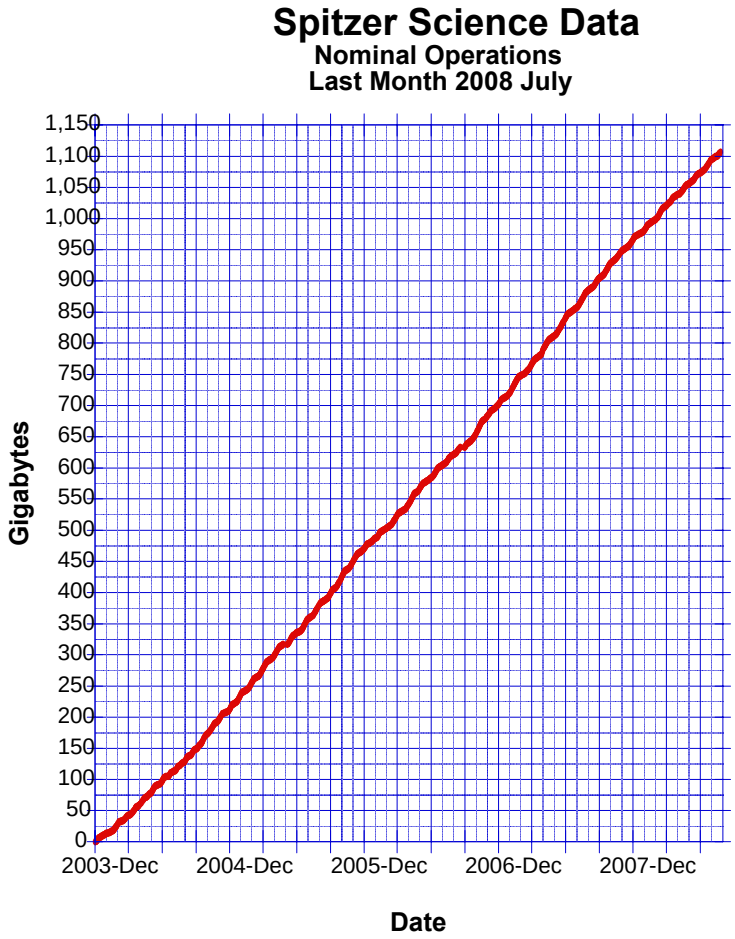
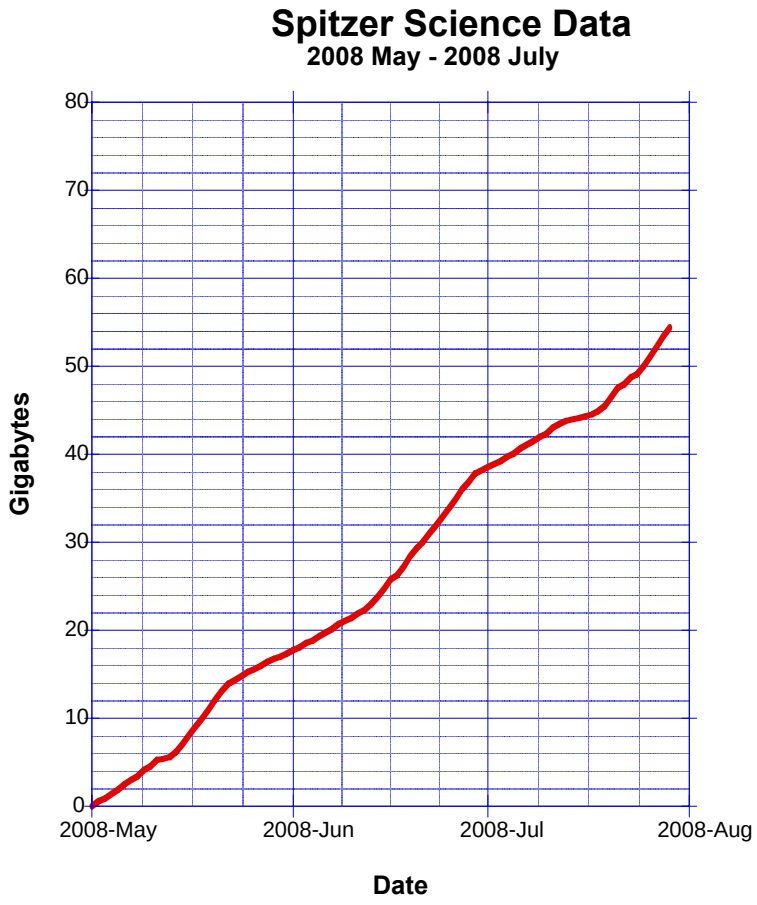
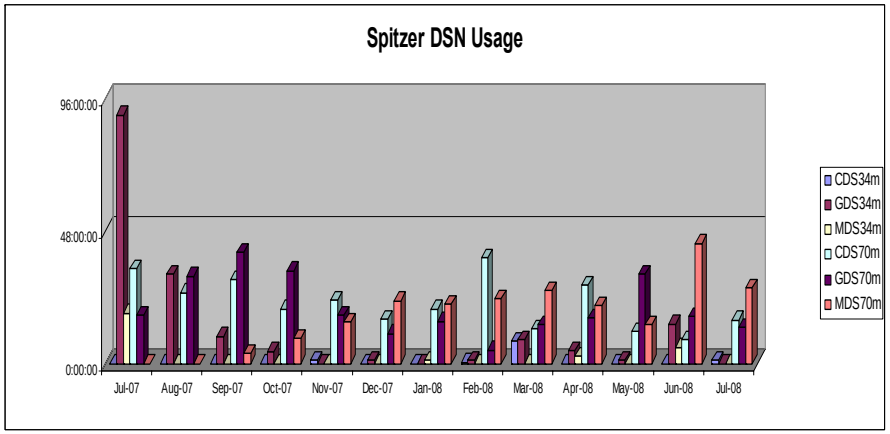
Science Data Delivery Metrics

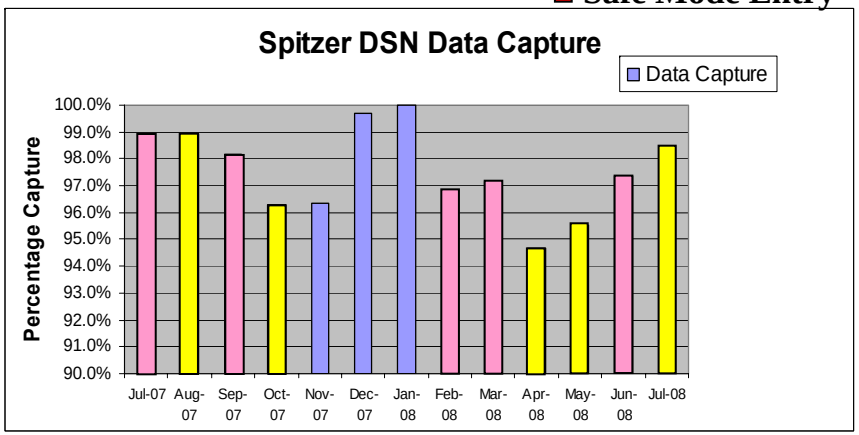


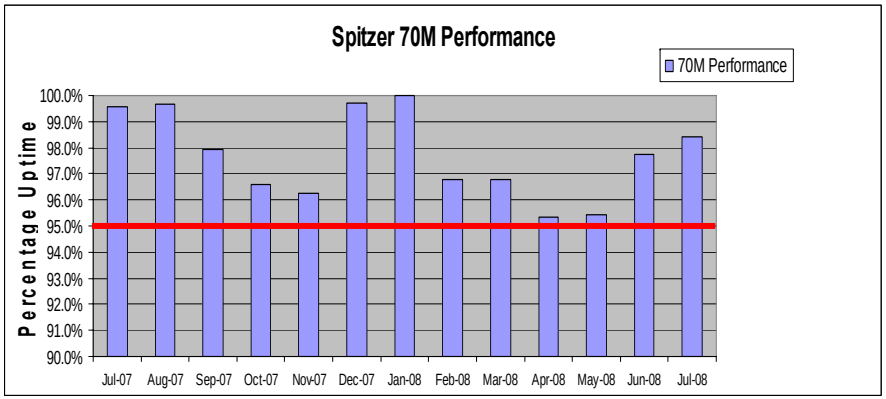


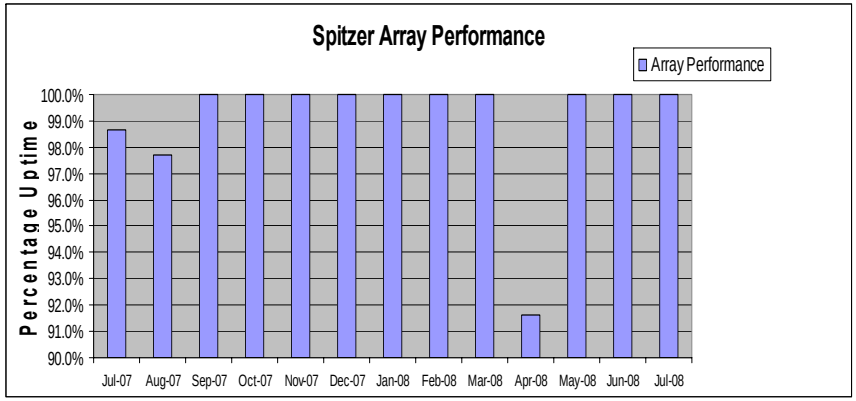
DSN Performance for SPITZER

Partial Pass
Missed Pass
Safe Mode Entry









DSN Commitment (95.00%)
Historical Experience (98.0%)

Summary

- The Observatory has been performing extremely well, without any Safing events since August 2006.
- Generally DSN support has been 98%
  - We will be using 70M/34M arrays starting ~10/28/2008 until the end of Cryogen
  - We are only single fault tolerant (i.e. we can miss a track once every 7 tracks).
- Spitzer's Critical Final Cryo Observations Period will begin 10/17/2008 (see attached request)
- Beginning ~4/18/2009 (depending upon actual date of Cryo depletion) we will be performing a Warm Instrument Checkout (WIC) to begin the Spitzer Warm/Extended Mission

- Thanks for your support

Request to Elevate Spitzer Priority for Spitzer's Critical Period

Background

- Spitzer needs to maintain our operational efficiency during the last few months of our prime mission.
- Several things happen during that time that will make it difficult:
  - Dropping telecom margins
  - Each of the 70 m antennas in turn will be taken down for six months at a time.
  - Astronomical targets to be viewed by IRS and MIPS will have their last opportunity during the last six months of the Cryogen/Prime mission.
- We've defined the "critical period" to be the last six months of cryogen.

Critical Period

- Based on the telecom predicts, project helium usage, planned DSN outages, and retirement of antennas, the critical period is defined as follows:

	Date	Length of Critical Period (days)
Start Last 6 Months Of He	10/17/2008	0
Loss of 2.2 Mb/s on 70 m	10/28/2008	11
5% Worst End of Cryogen	1/6/2009	81
2σ Worst End of Cryogen	3/26/2009	149
Avg End of Cryogen	4/18/2009	172
2σ Best End of Cryogen	5/11/2009	195

- The DSN will take each 70 m station down in turn for six months starting January 2009. The current order is Canberra, Madrid and Goldstone.
- There are also several significant planned outages of antennas before the critical period.
- Also lots of competition from other mission at similar right ascensions.

Link Margin Table

20 Degrees Elevation	2.2 Mbps	1.65 Mbps	1.1 Mbps	550 kbps	275 kbps
34m BWG	X	X	X	08/267	10/311
34m HEF	X	X	X	08/279	10/323
34m SBWG	X	X	X	08/365	11/307
Array: BWG + HEF	X	X	07/329	10/039	13/311
Array: SBWG + BWG	X	X	07/364	10/314	14/037
Array: SBWG + HEF	X	X	08/004	10/321	14/051
Array: Three 34m	X	07/338	08/346	12/022	*
Array Four 34m	07/328	08/289	09/326	13/330	*
70m	08/302 10/28/2008	09/286 10/13/2009	10/365 12/31/2009	*	*
Array: 70m + 34m	08/340 12/5/2008	09/333 11/29/2009	11/276 10/3/2011	*	*

30 degrees Elevation	2.2 Mbps	1.65 Mbps	1.1 Mbps	550 kbps	275 kbps
34m BWG	X	X	X	08/312	10/365
34m HEF	X	X	X	08/321	11/014
34m SBWG	X	X	X	09/264	12/024
Array: BWG + HEF	X	X	07/363	10/311	14/032
Array: SBWG + BWG	X	07/255	08/053	11/013	*
Array: SBWG + HEF	X	07/263	08/242	11/024	*
Array: Three 34m	07/269	08/012	09/031	12/329	*
Array Four 34m	07/359	08/327	10/006	14/047	*
70m	09/013 1/13/2009	10/014 1/14/2010	11/342 12/8/2011	*	*
Array: 70m + 34m	09/273 9/30/2009	10/290 10/17/2010	12/262 9/18/2012	*	*

Summary

- In consideration of the above, Spitzer Science should have higher priority during the Critical Final Cryo Observations Period (10/17/2008 through approximately 5/1/2008 end of Cryogen)
- than
  - Any Extended Mission Project (e.g. Cassini, MER, …)
  - Any Development Mission Project (e.g. MSL, Kepler, …)
  - Any Prime Mission Project (considering our finite resource of cryogen)
- We understand that we will not have higher priority than
  - Missions in Safe Mode and or critical events
  - Missions launching/commissioning (including Kepler)

- Therefore we request 9X and DSN Scheduling to be sensitive to Spitzer's Critical Period and give priority to Spitzer when in contention.

Backup Information

Scheduling Rules

- MIPS
  - Two tracks per day, scheduled 12 hours apart, ±4 hours.
  - Tracks are 1 hr 40 min long.
  - We always use all tracks.
- IRAC
  - Two tracks per day, scheduled 12 hours apart, ±4 hours.
  - Tracks are 1 hr 25 min long.
  - Unused tracks to be released at pass 1 delivery.
- IRS
  - Two tracks per day, scheduled 12 hours apart, ±4 hours.
  - Tracks are 1 hr 25 min long.
  - Unused tracks to be released at pass 1 delivery.

Scheduling Rules

- Multi-pass rules
  - Always acquire the highest data-rate (2.2Mbps) pass available per "Single SSPA Operations chart.
  - Assume the use of a single 70M antenna until DOY 302/2008, above 20 degree elevation.
  - At least 1 hr of every track needs to be above 20 degree
    - Track can start below 20 degree or
    - End below 20 degree
  - If the majority of the track is below 20 degree elevation then the following MUST occur:
    - Lowering of data rate
    - A 1.65 Mbps pass must be followed by two 2.2 Mbps passes.
    - A 1.1 Mbps pass must be followed by four 2.2 Mbps passes.

      (Keep in mind that the "following passes" may be released so this is not a recommended pattern to follow. Best efforts is to always try to acquire the highest data-rate possible.)